# **Introduction to Earth**

## **Chapter 1**

# **Geography as a Field of Learning**

## Physical Geography

### Environmental geography

#### Rocks

#### Landforms

#### Soil

#### Flora

#### Fauna

#### Climate

#### Water

#### Minerals

# **Geography as a Field of Learning**

## Cultural Geography

### Human geography

#### Population

#### Settlements

#### Economic activities

#### Transportation

#### Recreation activities

#### Languages

#### Religion

#### Political systems

#### Traditions

#### Other “human” elements

## **Study of Geography is the**

### **Why, What, Where, and so What**

# **Science and Geography**

## Science as a Field of Geography

### What exactly defines Science?

#### Science follows a process called ***scientific method***

##### Observe to **develop a question**

##### Create a ***hypothesis,*** guess about the answer to the question

##### ***Design an experiment*** to test the hypothesis

##### ***Make a prediction*** for the outcome of the experiment

##### ***Conduct the experiment and observe*** the outcome

##### ***Draw a conclusion or formulate a*** ***simple rule*** based on the results of the experiment

# **Numbers and Measurements**

## English Systems

### Inches, feet, miles, pounds, Fahrenheit

## International System of Measurement (SI) or metric

### Kilometers, Kilograms, and degrees Celsius

# **The Environmental Spheres**

## **Lithosphere** (*litho* (Greek for “stone”)

### Rocks of the Earth’s crust

### Broken and unconsolidated particles of mineral matter found over the bedrock

### All landforms, both on the seafloor and the surfaces of the continents and islands

## **Atmosphere** (*atmo* Greek for “air”)

### The complex mixture of gases needed to sustain life.

### Found closely to Earth’s surface, densest at sea level, and rapidly thinning with altitude

### Constant motion by solar energy and Earth’s rotation

## **Hydrosphere** (*hydro* Greek for “water”)

### All water in all its forms

#### Oceans

#### Precipitation

#### Cryosphere (*cry* Greek for “cold”) for all the water frozen as snow and ice

## **Biosphere** *(bio* Greek for “life”)

#### All the parts of Earth where living organisms can exists

##### Includes the vast variety of earthly life forms (often called *biota*)

# **The Solar System**

## ***The Sun****,* center of the Solar System

## ***Eight planets***

### With more than 100 revolving *moons*

## Unknown number of ***dwarf planets***

## Scores of ***comets*** (dirty snowballs)

## 50,000 ***asteroids***

## Millions of ***meteoroids***

# **Our Planets**

## Four inner planets (*Terrestrial planets*)

### Mercury

### Venus

### Earth

### Mars

## Four outer planets (*Jovian planets*)

### Jupiter

### Saturn

### Uranus

### Neptune

# **The Size of the Earth**

### **Radius**

#### 6400 kilometers (4000 miles)

##### Highest point (Mt. Everest) at 8800 meters (29,000 ft.) above sea level

##### Deepest point (Mariana Trench) 11,000 meters (36,000 ft.) below sea level

##### A difference of 20 kilometers or 12 miles

### **Diameter**

#### 12,735 kilometers (7909 miles)

### **Circumference**

#### 40,000 kilometers (24,900 miles)

##### First figured by ***Eratosthenes*** (Greek geographer, using mathematical calculations of angles)

##### His figures were 43,000 kilometers (26,700 miles)

# **The Shape of the Earth**

## Properly described as ***oblate spheroid*** Not a true sphere

### Cut through the equator, the earth is circular

### Cut through the poles, the earth is ellipsoidal

### This is due to the rotation of the earth which causes the middle to bulge and flatten the poles

# **Geographic Grid**

## **We use a geographic grid to help locate features on the surface of the earth**

### The grid system of the Earth is referred as a **graticule** **grid**

### Rotation of the earth allows for the creation of the grid of latitude and longitude

#### The north and south poles are found on the **rotational axis**.

#### The equator is found on an **imaginary plane** passingthrough the Earth halfway between the poles.

# **Great and Small Circles**

## A **great circle** is the largest circle that can be drawn through a sphere.

### The sunlit portion of the earth at any moment (the ***Circle of Illumination***) is a great circle.

### Only one great circle can be drawn on a sphere to include any two given points (not diametrically opposite each other)

## All other planes intersecting through a sphere would be **small circle**s

### The ***Arctic and Antarctic Circles*** would be small circles

# **Latitudes**

## The description of location expressed as an angle **north** or **south** of the **equator**.

## Expressed in degrees, minutes, and seconds

### 360 degrees in a circles

### 60 minutes in a degree

### 60 seconds in a minute

## Latitude varies from 0 degrees at the equator to 90 degrees at the North or South Pole

## All latitudes north of the Equator are considered in the **North Latitudes**

## All latitudes south of the Equator are considered in the **South Latitudes**

## All connecting points of the same latitude is called a **parallel**

## The **Equator** is the one great circle of the parallels with all the rest being small circles

## All parallels are aligned in true **east-west** directions on the Earth’s surface

## **Seven latitudes of significance** importance in the study of the Earth

### **Equator**, 0

### **Tropic of Cancer**, 23.5 N

### **Tropic of Capricorn**, 23.5 S

### **Arctic Circle**, 66.5 N

### **Antarctic Circle**, 66.5 S

### **North Pole**, 90 N

### **South Pole**, 90 S

# **Regions of Latitudes**

## **Low Latitudes**

### Generally between the equator and 30 N & S

## **Mid Latitudes**

### Between about 30 and 60 N & S

## **High Latitudes**

### Latitudes greater than about 60 N & S

## **Equatorial**

### Within a few degrees of the Equator

## **Tropical**

### Within the tropics (23.5 N and 23.5 S)

# **Longitude**

## Angular description of the east-west location

## Measured in Degrees, Minutes, and Seconds

## Lines are called **Meridians**

### They are **NOT** parallel to one another **EXCEPT** at the Equator

## As they move towards the Poles they become **increasingly close**, finally converging at the Poles.

## Distance between the Meridians varies

### The distances is about the same as the Parallels are at the Equator

### As Meridians converge to the poles, the distance between the them decreases, diminishing to zero at the poles

### The baseline for the Meridians is the “**Prime Meridian”** which passes through the Royal Observatory of Greenwich, England

### Halfway around the world at 180 degrees either east or west is the “**International Date Line**”

## **All Meridians are great circles**

# **Earth-Sun Relations**

## Earth Rotation on its Axis

### Rotates west to east Counterclockwise looking down at the North Pole

### One complete rotation every 24 hours

# **Effects of the Rotation of the Earth**

### Causes a deflection the flow path of both air and water, known as the ***Coriolis affect***

### Brings any point on the surface through the increasing and then decreasing gravitational pull of the moon and the Sun

#### Rise and fall of water know as Tides

### The effect of the ***diurnal*** (daily) alternation of light and darkness

#### A misalignment of our ***circadian (daily) rhythms*** (your inner body clocks) are interrupted by air travel, it will cause “jet lag”

# **Earth’s Revolution around the Sun**

## The revolution of the Earth around the Sun takes 365 days, 5 hours, 48 minutes, and 46 seconds. This is a **tropical year** and for practical purposes it is shortened to 365.25 days.

## Because of the extra quarter of a day, we have leap year every fourth year

# **Earth’s path around the sun**

## The path around the sun is an ellipse

### The **farthest point**, on July 4th is called the **Aphelion** (94,555,000 miles)

### The **closest point**, on January 3rd is called the **Perihelion**, (91,455,000 miles)

### The **average distance** of the earth from the sun is defined is **One Astronomical Unit** (**1AU**) or 92,955,806 miles

# **Inclination of Earth’s Axis**

## The imaginary plane defined by the orbital path of the Earth is called the **plane of the ecliptic**

## The Earth maintains its 23.5 degree tilt away from perpendicular to the plane of the ecliptic. This tilt is called the **inclination of the Earth’s axis**

# **Polarity of the Earth’s Axis**

## The Earth’s **rotational axis** is always at the **same inclination** during its rotation around the Sun and its **axis always points** in the same direction relative to the North Star, Polaris.

## This characteristic is called the **polarity of the rotation axis (or parallelism).**

## The **combination** of **rotation revolution, inclination**, and **polarity** result in the **seasonal patterns**.

# **The Annual March of the Seasons**

## **Three** **conditions of the changing of the seasons**

### The **latitude** receiving the **vertical rays of the sun**

#### Sub-solar point or the declination of the Sun

### The **solar altitude** (the height of the Sun above the horizon) at different latitudes

### The **length of the day** at different latitudes

# **Special Days of the Year for the Seasons**

## **June Solstice**

### Around **June 21** (First Day of Summer)

### Sun’s rays perpendicular to the Tropic of Cancer

### Longest Day of the year

### Areas of the Arctic Circle in 24 hours of sunlight

## **September Equinox**

### Around **September 22** (First Day of Fall)

### Sun rays perpendicular to the Equator

### Equal hours of sunlight and night

# Special Days of the Year for the Seasons

## **December Solstice**

### Around **December 21** (First Day of Winter)

### Sun’s rays perpendicular to the Tropic of Capricorn

### Shortest day of the year

### Areas of the Arctic Circle in 24 hours of darkness

## **March Equinox**

### Around **March 20** (First Day of Spring)

### Sun rays perpendicular to the Equator (again)

### Equal hours of sunlight and night

# **Seasonal Transitions**

## **Migration of the vertical rays** of the sun between the latitudes from season to season

## **Day length**

### Equator only place on the earth where the day length is constant throughout the year

### Migration of the sun and the length of the day

### Angle of the rays of the sun in different latitudes, difference in the energy the surface receives

* The ***relationship of the angle of the sun rays***, the ***length of the day*** are the important **seasonal transitions** of the earth

# **Telling Time**

## Three natural units of time

### **Tropical year**, return of the seasons

### **Lunar month**, return of the new moon

### **A day**, marked by the passage of the sun

## **Daily time kept since early civilizations**

## Romans identified the importance of the noon hour with termed relationships to the meridian

### **A.M comes from ante meridian**

### **P.M. comes from post meridian**

# **Time Zones**

## No standard time zones until **1884**

## **24 standard time zones set starting at the Greenwich Prime Meridian**

## **Prime Meridian is the center of the time zone**, with **7.5 degrees to the east and 7.5 degrees to the west**

## **Time at the Prime Meridian** known as

### **Greenwich Mean Time (GMT)**

### **Universal Time Coordinated (UTC)**

### Some countries do not adhere to standard times

## Zones follow **administrative boundaries, state or country boundaries**

## Some large countries have many zones

### **Russia with 9 zones**

### **China, has only one, this is Beijing’s**

## Some areas have only one time zone

### **Europe is basically one time zone**

## **International Date Line**

### Magellan’s crew first discovered the date line when they traveled around the world and found they were one day behind when the returned to Europe

### Pacific Ocean location effects less people

### Date line follows the 180 degree meridian (sort of)

# **Daylight-saving Time**

## Adopted in **WWI** to conserved energy in Germany

## In **1918, the United States** adopted it

## Was not **complete accepted** until the **Uniform Time Act was passed**

### **Arizona, Hawaii, and parts of Indiana do not participate**

## **Russia has permanent daylight-saving time** with double saving time in the summer but in 2014 it will discontinue the use of daylight-saving time

## **In recent years, Canada, parts of Australia, New Zealand, and most of West Europe have adopted it**

## **Not practiced in the tropics and many other parts of the world**